STORY OF THE INCEPTION AND GROWTH OF THE DE FOREST WIRELESS SYSTEM

The Inventor Chose His Field Deliberately, and What He Has Accomplished All the World Now Knows.

WHEN CAPT. LIONEL JAMES and Dr. Lee De Forest booked their passage on the same steamer from Liverpool last December, although each was unconscious of the other, it was the first of a series of events which have added greatly to the fame of them both. Capt. James, as correspondent of The London Times and THE NEW YORK TIMES, was just starting for the Orient in anticipation of the present war. He had already made a name for himself in several British campaigns. But now, because he and Dr. De Forest met on the Majestic and laid plans together, he has won an international reputation. His unique war dispatches have alone in some cases supplied the world with full news of naval engagements and military movements and in other cases have anticipated the reports of other correspondents by many hours.

The means by which this was accomplished was wireless telegraphy, and it is here that Dr. De Forest's fame has been served. De Forest wireless telegraphy was already a familiar subject in this country and also in England by virtue of the successful test across the Irish Sea, from which the inventor was just returning when he met Capt. James. But now his system has aroused the Czar of Russia, has been discussed by the Cabinet of the President of the United States, and commented on by leading papers the world over. Through the pronunciamento of the Russians threatening correspondents using wireless as spies De Forest wireless has raised a question of international law for the jurists to settle.

At Capt. James's suggestion a contract was made for two complete sets of De Forest apparatus to be installed at the scene of hostilities. The receiving instruments employed were the same that Dr. De Forest used in the British Isles, and accordingly have made half the circuit of the globe to serve in this unique form of news gathering maintained by The London Times and THE NEW YORK TIMES. With the station erected at Wei-hai-Wei on the Yung-tcheng Peninsula as a land base, The Times's steamer Haimun has coursed back and forth over the Yellow and Korean Seas, and with its wireless equipment has aerographed its dispatches 50 or 150 miles, as the distance might be, with as much ease as if, spiderlike, it had spun a cable from Wei-hai-Wei to the various points of sending.

The operators for this work, H. J. Brown and H. E. Athearn, are two of the most skillful in the employ of the American De Forest Company. They were willing to undertake this long expedition, although the hardships of roughing it with war correspondents were explained to them, and the reception they were likely to get at the hands of either Japs or Russians as uncertain. For they are enthusiastic in their work, believe in its future, and, above all, pin faith to Lee De Forest. And this seems to be the case with all who are working for the system from officers to operators. In the De Forest system the name is not merely descriptive of origin; it is essential. The experimenters and machinists in the laboratories and the installers and operators in the field take their cue from De Forest. And the "Doctor" also occupies a prominent seat at council fires in determining matters of general policy and commercial development.

Those who know him best pronounce him one of the hardest workers they have known. But he must also be one of the most expeditious when at work, for he submits to an interview as if not afraid of being robbed of needed time. He is only thirty years of age, and appears no older in spite of the amount of work which he has crowded into the last four years. He sets aside no time for vacations, but he has learned to take rest in the shortest time by entire change of occupation. Like Sherlock Holmes, he can clear his mind when tired out by an evening at the opera, and complete absorption in music. Then, too, he finds impromptu vacations in reading when traveling. Shakespeare and Poe are his favorites, and he keeps them in convenient pocket editions.

Dr. De Forest comes of one of the oldest American families. Eight generations back a French Huguenot ancestor, Isaac De Forest, migrated to New Amsterdam in 1636 and established a plantation in Harlem, where he was the first settler. But even then this was not too far in the country for political influence, and he was chosen a Burgomaster under Peter Stuyvesant. The inventor's boyhood was mostly spent in Alabama, where his father, the Rev. Henry S. De Forest, was President of Talladega College. The father was a graduate of Yale, and all his life the son has been imbibing the Yale enthusiasm which numerous college pictures and souvenirs declare to a visitor to his apartments.

Unlike most students, he had clearly decided on his life's work before entering college. It was to be an inventor. He took to tinkering when a very small boy, and liked it better than play. At first his hobby was steam, and then electricity. A wooden locomotive which he built in the home yard played a good part in determining his occupation. This mogul, made with two barrels for the boiler and barrel heads for drivers, was complete in all its parts, even to reversing lever and eccentrics. One day a stranger, genial and enthusiastic, called to see the sight, and spoke so glowingly to the father about the son's mechanical turn, with a prophecy of success, that the boy decided he was built for an inventor. This conviction grew, and nothing was able to shake it until the splendid realization of the present forever proved its correctness.

Dr. De Forest has still the drawings of the inventions which came crowding out of his brain when in his early teens, the period of most fertile imagination. Truly they are more wonderful than any subsequent inventions, even in wireless telegraphy. They throw light on aerial navigation and even essay the perennial problem of perpetual motion. But when he prepared for college a hard study of science fixed his mind in practical lines, checking but not dwarfing his imagination. Thus when he entered Yale in the class of 1896 in the Scientific School he was actuated by a central purpose to prepare for an inventor's life. To this he soon added the conviction that electricity offered the best field, and in postgraduate study from 1896 to 1899 he determined that the most promising branch of electricity was the Hertzian waves, the medium of wireless telegraphy. A central purpose formed as a boy has been followed out consistently and has led to his present success in wireless telegraphy.

At the university he was considerably hampered by lack of funds and the necessity of self-support after the death of his father, but there can be no doubt that he made good use of his courses of study, whatever other phases of college life were denied him. He carried through his chemical and physical experiments in no perfunctory manner. One of the professors in the Scientific School is said to be still chary of praise for his famous pupil as he thinks of the nails which the latter drove into his laboratory table to study the experimental apparatus.

This episode is characteristic of the enthusiasm with which Dr. De Forest enters upon whatever work he chooses. When the call for volunteers was issued during the Spanish-American war he broke away from study to enlist in the Yale Battery of the First Connecticut Volunteers May, 1898. The only service the Yale boys saw was a Summer's encampment on the shores of Long Island Sound, but the inventor does not seem to regret the time spent with the military. When in 1899 Yale made him a Doctor of Philosophy for a thesis on Hertzian waves he was prepared in theory for his work in wireless telegraphy. The amount of work that lay between this and his present practical success he describes in graphic language.

Beginning at Chicago, where he found work on the editorial staff of The Western Electrician, he carried on his experiments at odd hours. It was here that he discovered the principle upon which the De Forest wireless receivers are constructed, and which most of all distinguishes the system from others. He styles it an electrolytic principle. He recognized this discovery as basic, and saw at once the possibilities of developing a strong system around it. When once he had seen the vision of possibilities and the first patent had been applied for, Dr. De Forest set about to realize his dream in the most direct and practical way.

After a successful test between the Water Crib and the Auditorium Hotel at Chicago, he borrowed money and came on to New York. He had the threefold task of giving practical tests, paying expenses, and soliciting the interest of capitalists. Nothing but rigid tests could be counted on to bring financial support, for another system was already in the field; the burden of proof was on the American inventor, and capitalists wished to see something distinctive and superior before lending a hand. It is not strange that these days of overwork brought on sickness. It is strange that they did not bring discouragement. Dr. De Forest says that he interviewed twenty-six different men, trying to get them to undertake the financing of his system, before he succeded in interesting Abraham White, now the President of the American De Forest Company.

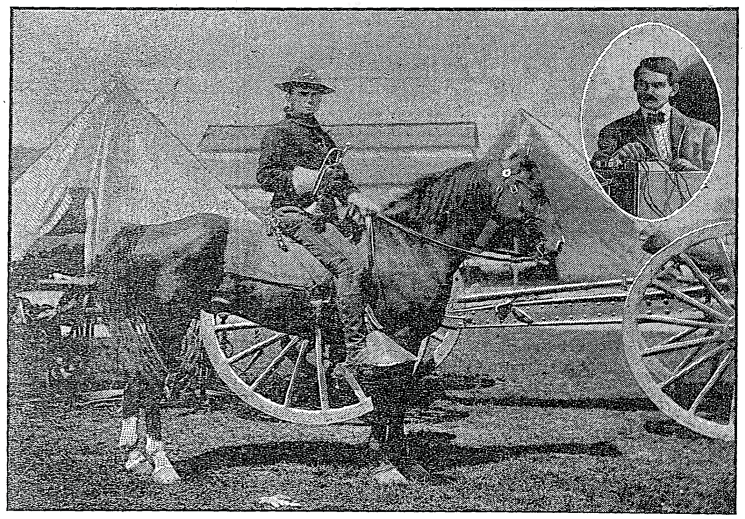
The inventor refers with just pride to the work of those days, but he prefers his present occupations, directing the installation of stations, experimenting at the laboratory, or working in his study. After each extensive trip he finds his desk burdened with English, German, and French scientific periodicals. These must be read, note books must be primed, and entries made in scrap books. For it requires system to direct the development of a wireless telegraph system.

Of course the apparatus used now is considerably in advance of the original devices. The instruments on The Times's steamer Haimun may be taken as showing present excellence. The receiver is known as the De Forest Responder No. 4, for, although the principle has remained the same, the form of apparatus has been improved four times. With this receiver the Hertzian waves from the sending station, which are gathered by the aerial wires held aloft by one of the masts of the Haimun, are introduced into the electrolytic circuit, the current for which is supplied by small dry cells in the receiver box. In this circuit the effect of the Hertzian waves is to vary the resistance of the current from the dry cells, and the result is a distinct sound heard in a telephone receiver attached to the circuit. As this disturbance continues just as long as the operator holds down the key at the sending station, it is very easy to receive the dots and dashes of the telegraph alphabet.

Dr. De Forest says that a special advantage of his present electrolytic receiver is that it responds well only to periodic vibrations, like the oscillations from the sending station, and, accordingly, is more exempt than other receivers from atmospheric electric influences, which are irregular and not periodic. This probably accounts for the Haimun's remarkable feat in sending messages 170 miles, as reported by Capt. James in his dispatch of April 13. The fact that the aerial wires on the Haimun are supported by a mast only seventy-five feet high and that the electric energy employed was only one kilowatt, or about seven-tenths of a horse power, makes this feat all the more remarkable.

Dr. De Forest pooh-poohs the idea of the Japs being able to tap the messages from the Haimun. The Japanese Navy utes the familiar coherers for receivers with tape-marks. As the speed of these instruments is limited to some ten words per minute, the effect of the De Forest messages, which run thirty words per minute, would be a practically unbroken dash on the tape. In addition to this The Times's operators have with them the De Forest tuning apparatus by which only waves of predetermined length are sent out, so that receiving instruments of inappropriate adjustment could not record the signals. In his protest at the Russian threat Capt. James says: "I possess a system of wireless telegraphy which, even if messages were not veiled by cipher, neither Japanese nor Russian instruments could record."

It is easy for Dr. De Forest to grow enthusiastic in speaking of the future development of wireless telegraphy. It is to have a broad humanitarian influence. Besides the general transmission of messages it will have a wide field in transmitting warning signals for the protection of life and property. Wireless shore stations, erected at a fraction of the cost of lighthouses, can send their warnings to vessels beyond the reach of light or foghorn. For this branch of work he has devised a "range finder" and a "localizer." By the former the distance from the sending station can be told with fair accuracy, and by the latter the direction is determined. He has an automatic bell device by which warning signals can be received without the service of an operator. This apparatus will demonstrate great usefulness when installed, as the inventor says it will be, in the cabs of locomotives to give warning of impending collisions. There are many points in the Far North where wireless telegraphy can alone supply communication, because shifting snow and ice destroy wires or cables. There are many islands to be connected by wireless telegraphy for populations too sparse to support a cable. The field is continually widening, and it is not strange that the inventor finds inspiration in his work.



Lee de Forest as a Bugler of the Yale Battery During the Spanish-American War.
The picture in the corner represents Mr. De Forest at the receiver of his wireless telegraph instrument.